## News

### SiTec GmbH Announces New Monosilane Decomposition Technology

*Augsburg/Germany, September 16, 2015* – Dr. Josef Biedermann, SiTec GmbH' CEO and Managing Director, announced today that SiTec is developing a highly efficient technology that when perfected will reduce monosilane fluid-bed reactor (FBR) capital and operating costs by approximately 45% each, compared to legacy FBR decomposition processes.

Called ***Genesis™***, SiTec's technology fluidizes the granular reaction bed by mechanically induced vibration as opposed to gas induced (a.k.a., "hydraulic") fluidization used by legacy processes. SiTec calls its development "vibrationally fluidized bed reaction" or "VFBR" for short. Coupled with SiTec's proprietary monosilane process technology, known as ***STAR™*** (SiTec Applied Research), SiTec forecasts polysilicon plant investment and energy consumption will be reduced by approximately 35% each compared to legacy FBR processes.

**Cash cost <10USD/kg:** SiTec forecasts cash cost substantially below 10USD/kg polysilicon and could be reduced to 7USD/kg polysilicon (for a 10,000 MTA green-field plant) in China

**Lower Capital cost:** SiTec expects that capital cost can be substantially reduced up to 30% (for a 10,000 MTA green-field plant) compared to legacy monosilane/FBR polysilicon or refined TCS/Siemens plants.

The net present value for a 10,000 MTA polysilicon plant in China using ***Genesis™*** technology – compared to legacy monosilane/FBR and legacy refined TCS/Siemens polysilicon plants – is forecast at $365 million to $700 million US respectively.

**How it works:** Legacy FBR processes fluidize reaction beds by blowing a mixture of monosilane gas (diluted to 5% to 20% concentration in hydrogen recycle) up through a bed of small silicon particles ranging in size from 75 to 3,000 microns. The feed gases lift and fluidize the bed. Decomposition and particle growth occur when monosilane gas contacts hot granules in the bed. Resultant epitaxial growth increases particle size until sufficiently large to be harvested.

Previous attempts to increase hydraulic fluid bed reactor productivity by operating at high pressure and high monosilane feed concentration have resulted in excessively high rates of dust formation and unacceptably low yield. In marked contrast, SiTec's ***Genesis™*** process is being designed to operate with 100% monosilane feed – no hydrogen dilution – and at high pressure, with less than 1% dust formation (based on ongoing lab tests).

**New pilot reactor:** SiTec is accelerating development work and recently started up a 1/5th commercial scale pilot reactor at its Seattle Center for Applied Research and Product Development. The pilot plant is being used to perfect its mechanically fluidized beds, prove commercial design and product quality, and verify the fast reaction rates, self-seeding, and high yields demonstrated in earlier lab test work.

**Fast reaction rates → highly productive reactor:** Reaction rates are fast because the ***Genesis™*** reactor is designed to run at high temperature (in the range of 600 C to 700 C) and pressure (up to 20 BARG), and with 100% monosilane in feed gas to the reactor. These high temperatures, pressures, and feed composition make for fast reaction rate and economical, highly efficient, small-sized reactors. ***Genesis™*** lab work shows dust formation in the range of 1% or less.

Seeds formed in the Genesis reactor tend to stay in the bed because exit gas velocity is very low – only 1/50th as high as in a legacy FBR. In comparison, the high exit gas velocity in a legacy FBR can blow a substantial fraction of seed particles smaller than 100 microns out of the bed necessitating the installation of costly ex-situ seed generation and recycle facilities.

**Benefits:** Contingent on continued success with its technology development program, SiTec expects ***Genesis™*** will bring the following advantages compared to hydraulic fluidization:

1. Fluidization is decoupled from gas flow meaning hydrogen dilution is not required
2. Reactor heat load is reduced because hydrogen dilution is not required
3. Lower reactor heat load enables a 80% savings in electrical demand (Electrical requirements are forecast to be 1 kwhr/kg polysilicon in commercial scale reactors)
4. Capital cost is lower because reactors are highly efficient and small in size, and because expensive hydrogen recycle equipment is eliminated and off-gas cooling and filtration loads are reduced in size by an order of magnitude
5. Yield is improved by ~15% (from 85% to 99+%) because less than 1% of monosilane feed is converted to poly-dust
6. The monosilane plant is 15% smaller for a given polysilicon production rate due to improved yield
7. The technology is self-seeding
8. Easy “on-off” operation (Time to steady-state reaction from a cold start is 2 to 3 hours)

Mark Dassel, Executive VP for polysilicon technology at SiTec's Seattle Center for Applied Research and Product Development, says "***Genesis™*** is an important new technology which when perfected will be a substantial improvement over legacy FBR processes." Dassel forecasts SiTec will commercialize ***Genesis™*** within 2 years. He concludes, "We believe that SiTec's ***STAR™*** line of monosilane and ***Genesis™*** polysilicon production technologies are the future of the industry."

**About SiTec GmbH**

SiTec is a global player providing comprehensive Engineering and Technology Packages for polysilicon production and integration of ingots and wafers.

Our worldwide proven reliable, innovative and energy saving production technology guarantees the highest final product quality at competitive manufacturing cost for semiconductor and solar grade silicon.

SiTec's Center for Applied Research and Product Development Seattle, USA with experts in science, technology and engineering, is driven by its vision to achieve lowest production cost and the highest quality polysilicon.

Our proven technology has been realized in numerous projects in China, South Korea, India, North America, Europe, CIS and the Middle East.

***Safe Harbor Statement:***

*This announcement may include predictions, estimates or other information that might be considered forward-looking. These statements, which express management's current views concerning future events, trends, contingencies or results, appear at various places in this announcement and use words like "anticipate," "assume," "believe," "continue," "estimate," "expect," "forecast," "future," "intend," "plan," "potential," "predict," "project," "strategy," "target" and similar terms, and future or conditional tense verbs like "could," "may," "might," "should," "will" and "would." While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. You are cautioned not to place undue reliance on these forward-looking statements, which reflect management's opinions only as of the date of this announcement. Please keep in mind that we are not obligating ourselves to revise or publicly release the results of any revision to these forward looking statements in light of new information or future events.*

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